RESPONSE OF OCTOBER 19, 2000

RELATED APPLICATION SERIAL NO. 09/318,396
NOW U.S. PATENT NO. 6,270,698

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF	:	Darrell Pope
FOR	:	STRESS-RELIEVED ACRYLIC OPTICAL LENSES AND METHODS FOR MANUFACTURE BY INJECTION COINING MOLDING
SERIAL NO.	:	09/318,396
FILED	:	May 25, 1999
EXAMINER	:	Mathieu Vargo
ART UNIT	:	1722
ATTORNEY DOCKET NO.	:	74218/01768

Cleveland, Ohio 44115-1475
October 19, 2000

RESPONSE TO OFFICE ACTION

Assistant Commissioner of Patents
Washington, DC 20231

Dear Sir:

Applicant responds to the first Office Action as follows.

CONFIRMATION OF ELECTION:

Applicant affirms the election of claims 1-19, Group I, for examination.

DECLARATION:

A new Declaration in compliance with 37 CFR 1.67(a) is submitted herewith.

DRAWINGS:

A Petition under 37 CFR 1.84 for acceptance of the colored drawings as filed as formal drawings for this application is submitted herewith.

AMENDMENTS:

IN THE SPECIFICATION:

On page 3, lines 15-16, please delete "which causes the cavity plate to collapse between the mold halves" because this erroneously refers to the operation of the three-plate mold embodiment described in the next paragraph.

On page 3, line 27, please delete the second occurrence of "plate".

On page 4, after the heading "Brief Description of the Figures", please insert the following: --The file of this patent contains at least one drawing in color. Copies of this patent with colored drawings will be provided by the Patent and Trademark Office upon request and payment of the necessary fee.—

On page 14, line 23, after "stress emerge with a relative phase shift and", delete the word "product" and insert the word –produce—in place thereof.

In the Abstract the changes are as follows,

Stress-relieved molded acrylic opthalmic lenses, and injection-coining mold processes for molding stress-relieved plus and minus to high-minus diopter ophthalmic lenses of optically superior acrylic resin, able to pass standardized impact drop tests for use in eyeglass lenses, are described. The injection-coining processes use two-plate and three-plate mold assemblies. The cavity of a two plate runnerless mold is partially filled under partial tonnage, and the movable half of the mold controlled to coin and densify the acrylic resin under secondary or full tonnage, [with excess material flowing to an overflow tab which acts to localize and eliminate weld lines] when a velocity-pressure changeover point is reached. In a process which employs a three-plate

mold assembly, the lens mold cavities are partially filled under less than total clamp tonnage, with a cavity plate held by hydraulic pressure against movable half of the mold. The mold assembly is then closed under full tonnage when a velocity-pressure changeover point is reached, collapsing the cavity plate [between the moveable core half and] against a stationary platen [assembly], bringing the mold assembly to a total stack height. The processes produce impact resistant acrylic ophthalmic lenses which are stress-relieved and without weld lines, even in the high minus diopter range, with center thickness' as low as one millimeter, the edge thickness' up to ten millimeters.

IN THE CLAIMS:

1. A method of molding a negative diopter stress-relieved ophthalmic lens out of acrylic resin material by an injection-coining mold process, the method comprising the steps of:

providing an injection molding machine having a mold clamp and a mold material injection screw, with a two plate fixed cavity mold having a movable half and a stationary half with at least one mold cavity defined between the movable half and stationary half, the mold cavity having varying thickness dimensions, with a center thickness less than a peripheral thickness, and an overflow area extending from the mold cavity, the movable mold half operatively controlled to exert variable clamping pressure against the stationary mold half,

preparing the injection molding machine for operation with acrylic resin as a molding material by inputting predetermined molding process control parameters into a control system, the molding process control parameters being selected to avoid formation of stresses in the lens, the molding process control parameters including plastic temperature, plastic flow rate, plastic pressure, plastic cooling rate, clamp closing velocity, velocity-pressure changeover position and coining stroke,

initiating the mold process by closing the mold halves together under a primary clamp pressure at a specified partial tonnage,

advancing the injection screw to partially fill the mold and to reach a velocity-pressure change over position, at which

[applying] a secondary clamp pressure is applied to the mold at a specified tonnage greater than the partial tonnage to perform a coining operation on the acrylic resin material in the mold,

holding the injection screw under time and pressure,

advancing the injection screw under the packing time and pressure,

retracting the injection screw back to a metering ready position,

allowing the acrylic resin material to solidify within the mold during a specified cooling time,

opening a movable half of the mold to a stop point, and

ejecting a stress-relieved acrylic lens out of the mold.

14. A method of making stress-relieved negative diopter ophthalmic lenses out of acrylic resin by injection-coining with a three-plate mold assembly in an injection molding machine having a mold clamp operative to apply variable pressures to the mold assembly, the three-plate mold assembly having a stationary plate/a movable plate/and a cavity plate [having] and at least one mold cavity configured to form a negative diopter opthalmic lens having a center thickness dimension less than a peripheral thickness dimension, and a mold material injection screw operative to heat the acrylic resin and fill and pack a mold cavity in the mold assembly, the mold assembly having a mechanism operative to control a position of a cavity plate relative to a stationary plate of the mold assembly, the method comprising the steps of:

preparing the injection molding machine for operation with the three-plate mold assembly and acrylic resin by inputting control parameters into a control system for the injection molding machine, the control parameters including plastic temperature, plastic flow rate, plastic pressure, plastic cooling rate, clamp closing velocity, velocity-pressure changeover position, and degree of movement of the cavity plate relative to the stationary plate of the mold,

opening a moveable plate of the mold assembly to an opening set point,

extending the cavity plate to a position spaced from the stationary plate of the mold assembly;

applying a primary clamp pressure to the mold assembly;

partially [fitting] filling the cavity within the mold assembly by operation of the injection screw to reach [until] a velocity-pressure changeover position [of the injection screw is readied].

[applying] at which a secondary clamp pressure to the movable plate of the mold assembly which is greater than the primary clamp pressure, the secondary clamp pressure, the secondary clamp pressure causing the cavity plate to collapse against [move toward] the stationary plate of the mold assembly,

holding the injection screw according to time and pressure control parameters,

advancing the injection screw according to packing time and pressure control parameters, allowing the material in the mold cavity to solidify and cool, and

moving the movable plate to open the mold assembly to allow ejection of a molded lens[es] from the mold cavity.

REMARKS

Claims 1-19 were rejected under 35 USC §103(a) as unpatentable over Maus '769 in view of Japanese Document 61-66623, and Ratkowski, U.S. Patent No. 4,254,065. Withdrawal of this rejection for the following reasons is respectfully requested.

Applicant's claim 1 defines a method of molding a negative diopter stress-relieved lens out of acrylic material by injection-coining using a two-plate mold. Claim 14 defines a method of molding a negative diopter stress-relieved lens out of acrylic material by injection-coining using a three-plate mold assembly, which has a hydraulic actuated movable cavity plate which extends away from the stationary A half, and collapses against the stationary A half under full tonnage. Prior to this invention, negative diopter lenses were not injection molded using acrylic without the use of custom molds with expandable cavities and intricate overflow reservoirs. In both the two and three-plate processes, the velocity-pressure changeover point is used for both injection control (speed v. pressure) and triggering the coining/full-tonnage operation of the mold clamp. There is then additional screw advance under full clamp tonnage or "secondary clamp pressure". The prior art does not disclose or suggest this sequence of molding process steps.

The Maus '769 Patent

The Maus '769 patent describes a toggle-clamp mold assembly with an internal cavity enlargement system for molding polycarbonate lenses. The toggle-clamp provides multiple-stage compression of polycarbonate resin to first redistribute the resin and vent the cavities, and then compress the polycarbonate to compensate for cooling-induced shrinkage.

Maus describes the steps of:

1. Forming a variable volume closed mold cavity;
2. Injecting a mass of resin into the mold cavity larger than the mass of the article to be formed;
3. Applying a main clamp force to the mold to redistribute the resin, and
4. Maintaining the main clamp force until the resin solidifies. Col. 12, line 49-61.

These steps are described only in connection with the Galic-Maus injection/compression molding system which has a stationary mold platen 82, a movable mold platen 90, and a cavity enlargement system 104. The cavity enlargement system 104 includes hydraulically actuated "resilient members" 13 which allow the B mold plate 74 to move relative to the die inserts 5b in each mold cavity. The Maus patent does not describe or claim molding of negative diopter lenses out of acrylic material. He acknowledges only that injection molding of acrylic or polycarbonate thermoplastic lens in fixed cavity molds is problematic. Maus col. 4, line 38 to col. 5, line 16.

Maus acknowledges that, at the time of the '769 patent application (1986) the then current state-of-the-art in clamp-induced coining was possible only within a narrow band of process parameters, including injection pressure and fill rate; air gap dimension, timing interval between injection and compression; and final clamping forces. Maus col. 8, lines 27-37. There is no mention of the velocity-pressure (VP) change over point, nor any suggestion that this is the point at which the coining operation of the mold should occur.

Maus columns 7 and 8 discuss prior art injection/compression molding of lenses and the problems therewith. He offers no solution other than to use his particular type of cavity enlargement mold. Applicant's claimed method does not use a variable volume cavity enlargement type mold to avoid molded-in stresses.

Furthermore, there is no disclosure or suggestion of injection process parameters proven to work with acrylic. Maus cols. 9 through 11 discuss prior art "auxiliary component" injection/compression molding of lenses, also without any specific discussion or disclosure of control parameters suitable for acrylic.

In fact, it was not well known prior to applicant's invention to injection mold negative diopter lenses with acrylic material other than with complex mechanical mold systems such as Weber, Johnson, Bartholdsten and Laliberte. The prior art acrylic lenses listed in Applicant's Fig. 7, nos. 8 and 9, were cast or baked. Maus col. 30 refers to the transfer pockets described by the Weber patents into which excess melt is forced during compression, in an attempt to eliminate knit lines. These prior art mold systems are mechanically different than the system claimed by the applicant. The mere recognition of some of the various parameters to be controlled: injection pressure, fill rate, timing, clamp forces, etc. does not amount to a teaching or suggestion of the invention as claimed, particularly with regard to velocity-pressure changeover.

Applicant's Claims

Applicant's claims 1-14 define a method of use of a two-plate fixed cavity mold to produce a negative diopter stress-relieved lens. In addition to not describing any method of use of a two-plate fixed cavity mold (other than in the prior art), Maus does not describe any of the claimed process parameters such as:

"advancing the injection screw to partially fill the mold and to reach a velocity-pressure changeover position,"

"at which a secondary clamp pressure is applied to the mold at a specified tonnage greater than the partial tonnage to perform a coining operation on the acrylic resin material and the mold,"

Ratkowski describes injection molding of contact lenses using a very particular type of mold having a cylindrical cavity bore, a cavity pin in each cylindrical cavity bore which defines a lens surface, an injection section which engages the cavity plate along a part-line, with the ejection section defining a bore axially aligned with the cavity bore, an insert in the cavity bore

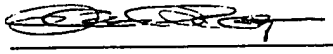
which receives an end of the cavity pin with an ejection pin in the insert which defines the second surface of the lens. This is a variable volume mold system which Applicant's method does not use. The parameter settings set forth in Table I of Ratkowski are irrelevant to the claimed invention because they are for use with a completely different type of mold assembly. In fact, the parameters given for injection hold time; injection pressure, nozzle temperature, barrel temperature rear, mold temperature and material temperature at the nozzle would not work with either the two- or three-plate mold processes. Pope Declaration, para. 5. Ratkowski does not disclose or suggest the steps defined by Applicant's independent claims 1 or 14.

Furthermore, the mere addition of the step of micro-adjustment of injection pressure during cavity fill, as taught by the Japanese '623 patent, to the method of Maus, would not produce the results of the claimed invention. The Japanese patent does not teach partial fill in combination with the use of the velocity-pressure changeover position to trigger secondary clamp pressure.

In view of the foregoing, it is respectfully submitted that the present application is now in proper condition for allowance. If the Examiner believes there are any further matters which need to be discussed in order to expedite the prosecution of the present application, the Examiner is invited to contact the undersigned. If there are any fees necessitated by the foregoing communication, please charge such fees to our Deposit Account No. 50-0902, referencing our Docket No. 74218/01768.

Respectfully submitted,

ARTER & HADDEN LLP



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CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8

I hereby certify that this correspondence (along with any paper referenced as being attached or enclosed) is being deposited on the below date with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

Date: 10-19-00

Valerie A. Milam

Name: Valerie A. Milam